Computer Networks & Software, Inc.

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Final Technical Report

to

NASA GRC

for

Industry Support

NASA Contract No. NAS 3-99165, Task Order 19

December 17, 2003

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Task Order 19 – Industry Support
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1. INTRODUCTION

This report summarizes the tasking contained in the Statement of Work and describes the results of the project. In addition, it addresses the principles, procedures, and methods of application that would be generally applicable to using the results of the project.

2. STATEMENT OF WORK

2.1. Background

NASA Glenn Research Center (GRC) is responsible for the Advanced Communications for Air Traffic Management (AC/ATM) Project, a sub-element task of the Advanced Air Transportation Technologies (AATT) Project of the NASA Aviation System Capacity Program (ASC). The AC/ATM Project is developing new communications technologies and tools that will improve throughput in the U.S. Air Traffic Control System.

The goal of the AC/ATM Project is to enable a communications infrastructure providing the capacity, efficiency, and flexibility necessary to realize benefits of the future mature Free-Flight environment. The capabilities and scope of communications technologies needed to accomplish this goal depend on characteristics of the future Free-Flight environment. There are many operational concepts being proposed for a future ATM system to enable user flexibility and efficiency.

GRC's focus is on developing new technologies and techniques to support the digital communication of information involving airborne and ground-based users. However, the technologies and techniques must be integrated with the systems and services that industry and the Federal Aviation Administration (FAA) are developing. Thus, GRC needs to monitor and provide input to the various industry and FAA organizations and committees that are specifying new systems and services.

Adoption of technologies by the FAA is partially dependent on acceptance of the technology by the aviation community. The commercial aviation community in particular would like to adopt technologies that can be used throughout the world. As a result, the adoption of common or at least compatible technologies by European countries is a key factor in getting commitments to those technologies by the US aviation community. GRC desires to keep informed of European activities that relate to aviation communication technologies, particularly those that are being supported by Eurocontrol.

2.2. Detailed Task Descriptions & Specific Work Elements

GRC will participate with RTCA, Airline Electronics Engineering Committee (AEEC), Eurocontrol, the iPAXS Task Force, the Internet Engineering Task Force (IETF), and other committees and working groups in shaping the aviation communications mechanisms. GRC has a requirement for a contractor knowledgeable in this environment to augment its efforts. The contractor shall perform the following tasks in support of GRC during Fiscal Year 2003.

2.2.1. Industry Collaboration

GRC intends to interact with the airline community and participate with RTCA, the AEEC, Eurocontrol, the iPAX Task Force, the IETF, and other committees and working groups in shaping the communications mechanisms that will support the Air Traffic Control System in the United States.

The RTCA Special Committees that GRC intends to participate with as it relates to this task are:

- SC-189, Air Traffic Services Safety and Interoperability Requirements (ATS SIR)
- SC-194, Air Traffic Management Data Link Implementation
- SC-198, Next Generation Data Communications (NEXCOM)
- SC-186, Automatic Dependent Surveillance - Broadcast (ADS-B)
- RTCA Free Flight Steering Committee

The AEEC organizations are:

- ATN Working Group
- Data Link Workshop and Users Forum

The contractor shall attend meetings in support of the GRC representative. Occasionally, a GRC representative may not be available and the contractor shall attend a meeting as the GRC representative. The contractor will monitor the activities of industry and government committees related to aviation communications.

The contractor shall prepare and submit to the GRC Contracting Officers Technical Representative (COTR) a report that summaries key points about each meeting.

2.2.2. Position Papers and Analysis

Technical issues that are raised at a standards committee meeting may require analysis. The contractor will perform technical analysis and develop position papers for GRC. This may require technical collaboration with airlines, the FAA, the AEEC, Eurocontrol, the iPAX Task Force, the IETF, RTCA, NASA Research Centers, and other aviation related industry groups such as the National Business Aviation Association (NBAA) and the Aircraft Owners & Pilots Association (AOPA).

2.3. Task Reviews

The scope and specific work elements of this task will be reviewed at regular intervals to evaluate alignment with NASA GRC technical support areas and customer requirements.

2.4. Deliverables

2.4.1. Format

Meeting notes, reports, and position papers will be delivered to GRC as an MS Office 97 file. Normally, the file will be delivered as an e-mail attachment. Hard copies of the documents shall be prepared if directed by the COTR. The COTR will specify the number of hard copies required.

2.4.2. Schedule

Deliverable	Due Date
Meeting Notes	5 working days after completion of the meeting
Technical Analysis Reports	TBD
Position Papers	TBD

3. PROJECT RESULTS

Task Order 19 of NASA Contract NAS 3-99165 was conducted for the Industry Support task. The goal of the project was to monitor the activities of industry and government committees that are shaping aviation communications mechanisms. This report covers activity executed during Fiscal Year 2003.

3.1. Industry Collaboration

As a part of this task, CNS participated with various RTCA subcommittees, Airline Electronics Engineering Committee (AEEC) subcommittees and working groups, Eurocontrol, and other committees and working groups in shaping the aviation communications mechanisms. CNS attended meetings of the RTCA Special Committees, SC-194, Air Traffic Management Data Link Implementation, SC-198, Next Generation Communications (NEXCOM), and SC-186, Automatic Dependent Surveillance – Broadcast (ADS-B). CNS also met with and made presentations to iPAX/Eurocontrol. CNS monitored the activities of industry and government committees related to aviation communications. After each meeting, CNS prepared and submitted a report summarizing key points for the meeting (minutes).

CNS continued to participate in the AEEC VHF Digital Link Subcommittee (VDL SC) to ensure that NASA GRC, along with the NASA Langley Research Center, is involved in formulation of standards. These standards are related to the airline's standards for ACARS, VDL Mode 2 Data Link, ACARS over Aviation VHF Link Control, Communications Management Unit (CMU) and the Aeronautical Telecommunications Network (ATN). GRC is the only NASA organization with continuous representation on the AEEC Aircraft Data Network Working Group. The ADN working group is setting the direction of future aircraft data networks. This will be important to the realization and acceptance of related domestic, satellite communications for the FF/DAG-TM Concepts, AWIN, and other NASA programs such as SATS that are now in research and development. This is particularly true if the new approaches are to use an IETF based internetworking architecture.

In support of this task, CNS attended the following meetings:

- RTCA SC-194: 10 – 13 Dec 02
- RTCA SC-194: 25 – 27 Mar 03
- RTCA SC-194: 10 Jun 03
- RTCA SC-198: 8 – 10 Oct 02
- RTCA SC-198: 13 – 14 Nov 02
- RTCA SC-198: 21 – 23 Jan 03
- RTCA SC-198: 27 Jan 03
- RTCA SC-198: 11 – 13 Feb 03
- RTCA SC-198: 18 – 20 Feb 03
- RTCA SC-198: 11 – 13 Mar 03
- RTCA SC-198: 25 Mar 03

- RTCA SC-198: 29 Apr 03
- RTCA SC-198: 25 Sep 03
- RTCA SC-186: 30 – 31 Jan 03
- RTCA SC-186: 23 – 24 Apr 03
- RTCA SC-186: 25 – 26 Jun 03
- RTCA SC-189: 23 – 27 Jun 03
- RTCA Symposium: 26 – 28 Feb 03
- RTCA Spring Forum: 24 Jun 03
- RTCA Joint Coordinating Committee 13 Dec 02
- RTCA PMC for NEXCOM SPR 21 Jan 03
- RTCA PMC for NEXCOM SPR 25 Jun 03
- AEEC ADN 664: 9 – 14 Nov 02
- AEEC ADN 664: 7 – 29 Jan 03
- AEEC ADN 664: 9 – 13 Mar 03
- AEEC ADN 664: 22 May 03
- AEEC ADN 664: 3 – 5 Jun 03
- AEEC ADN 664: 24 – 27 Jun 03
- AEEC ADN 664: 19 – 20 Aug 03
- AEEC DL Users Forum 4 – 7 Feb 03
- AEEC DLS: 3 – 7 Dec 02
- AEEC DLS: 14 – 16 May 03
- AEEC DLS: 15 – 16 Jul 03
- AEEC DLS: 8 – 10 Sep 03
- AEEC VDL SC: 12 – 13 May 03
- AEEC VDL SC: 11 – 12 Sep 03
- AEEC ATN 637: 14 – 17 Oct 02
- iPAX/EUROCONTROL: 23 May 03
- 3rd ICNS 2003 Conference 19 – 22 May 03
- NExTNAS CNS Workshop 20 – 21 Aug 03
- 21st Digital Avionics Systems Conference: 27 – 31 Oct 02

3.2. Standards Development

CNS participated in the development of the Draft AEEC Aircraft Data Network (ADN) Specification 664, which will define the Ethernet communications network for use in new airplane designs and retrofits. Specifically, CNS has:

- Worked on a security requirements analysis as part of the update to Part 5 of AEEC Standard 664, Network Interconnection Devices.
- Industry author to prepare draft inputs for Part 8 of AEEC Standard 664, Upper Layer Services for Aeronautical Telecommunications Network (ATN) and Airline Operational Control (AOC).
- Provided expert technical inputs for definition of Next Generation Communications (NEXCOM).
- Provided informal technical liaison to ADN 664 in order to bridge ATN over UDP/IP requirements.
    - Key issues: mobile IP, worked with IETF NEMO.
    - Obtained ICAO ATN participation/response.

3.3. Position Papers and Analysis

CNS presented papers at the 21st Digital Avionics Systems Conference (DASC). CNS also presented a briefing on aircraft communications security at an AEEC ad hoc datalink security conference and a briefing on security considerations at a joint AEEC ADN ARINC 628, 673, and 664 meeting. At the 2003 Integrated CNS Workshop, CNS was a session co-chair for communications, navigation, and surveillance, co-chaired a workshop on emerging technologies, presented a paper on security considerations, and made presentations on the Small Aircraft Transportation System (SATS) Airborne Internet (AI) and the Virtual Aircraft Capability (VAC) virtual controller. CNS also presented a paper on FASTE-CNS at the International Conference on Computer, Communications and Central Technologies in Orlando, Florida. RTCA meetings were attended and personnel participated in document development outside of the meetings. We were also instrumental in the development and publishing of the NEXCOM Safety and Performance Requirements document, along with change 1. For this activity, an employee was recognized by RTCA at the Spring Forum. CNS support GRC's IPv6/Eurocontrol project by attending kickoff, subsequent meetings and performing initial engineering analysis activity. Finally, the CNS team provided a Communications, Navigation & Surveillance Models presentation to GRC. The main task was to develop VAMS/HLA-compliant Communications, Navigation and Surveillance models to support modeling of aviation concepts and systems. In addition, a Program Management Plan (PMP) was written and presented to GRC.

3.4. Task Reviews

CNS participated in reviews of this task throughout the year in conjunction with other meetings and project reviews.

4. STUDY RESULTS USAGE

The Industry Support project would be applicable to understanding new communications technologies and tools that are available or planned by industry.

5. NEW TECHNOLOGY

This project did not involve the development of new technology.